



# DRAFT Builders Challenge National Program Requirements

December 12, 2011

To qualify as Builders Challenge, a home must meet the minimum requirements specified below, be verified and field-tested in accordance with HERS Standards by an approved verifier, and meet all applicable codes. Builders may meet the requirements of either the Performance Path or the Prescriptive path to qualify a home.<sup>1</sup>

## Builders Challenge Prescriptive Path

The prescriptive path provides a single set of measures that can be used to construct a Builders Challenge labeled home. Modeling is not required, but no tradeoffs are allowed. Follow these steps to use the prescriptive path:

1. Assess eligibility by using the number of bedrooms in the home to be built to determine the conditioned floor area (CFA) of the Benchmark Home, Exhibit 3. If the CFA of the home to be built exceeds this value, the performance path must be used.
2. If the prescriptive path is eligible for use based on the prior step, build the home using the mandatory requirements for all labeled homes, Exhibit 1, and all requirements of the Builders Challenge Target Home, Exhibit 2.
3. Verify that all requirements have been met using an approved verifier.

## Builders Challenge Performance Path

While all mandatory requirements for labeled homes in Exhibit 1 must be met, the performance path provides flexibility to select a custom combination of measures that meet performance level of the Builders Challenge HERS Target Home (Exhibit 2). Modeling is required, but measures can be optimized for each particular home or builder. Follow the steps below to use the performance path with RESNET-accredited Home Energy Rating Software programs:

1. The HERS Index of the Builders Challenge Target Home is determined. The Builders Challenge Target Home is identical to the home that will be built, except that it is configured with the energy efficiency features of the Builders Challenge Target Home identified in Exhibit 2. Note, any state energy code requirements that exceed those specified on Exhibit 2 take precedence for purposes of determining the Builders Challenge Target Home<sup>2</sup>. The HERS Index of the Target Home is automatically calculated in accordance with the RESNET Mortgage Industry National Home Energy Rating Standards.
2. A size modification factor is next calculated using the following equation:

$$\text{Size Modification Factor} = [\text{CFA}_{\text{Benchmark Home}} / \text{CFA}_{\text{Home To Be Built}}]^{0.25}, \text{ but not to exceed } 1.0$$

Where:

CFA<sub>Benchmark Home</sub> = Conditioned Floor Area of the Benchmark Home, using Exhibit 3

CFA<sub>Home to be Built</sub> = Conditioned Floor Area of the Home to be Built

Since the Size Modification Factor cannot exceed 1.0, it only modifies the HERS Index score for homes larger than the CFA of the Benchmark Home.

3. The HERS Index of the Builders Challenge HERS Target is calculated next<sup>3</sup>:

$$\text{Builders Challenge HERS Target} = \text{HERS Index of Builders Challenge Target Home} \times \text{Size Modification Factor}$$

4. Complete HERS software calculations for preferred set of energy measures and verify resulting HERS Index Score at or below the Builders Challenge Target Home HERS Index Score modified as required for house size.
5. Construct the home using measures that result in a HERS Index at or below the Builders Challenge HERS Target, calculated above, and the mandatory requirements for all labeled homes, Exhibit 1.
6. Verify that all requirements have been met using an approved verifier.



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## Exhibit 1: Builders Challenge Mandatory Requirements for All Labeled Homes <sup>4</sup>

Area of Improvement	Mandatory Requirements
1. Overall Home	<input type="checkbox"/> Compliance with all ENERGY STAR Qualified Homes Version 3 requirements and checklists
2. Envelope <sup>5</sup>	<input type="checkbox"/> Fenestration shall meet or exceed latest ENERGY STAR requirements <input type="checkbox"/> Ceiling, wall, floor, and slab insulation shall meet or exceed 2012 IECC levels
3. Cooling & Heating System	<input type="checkbox"/> Ducts inside conditioned space or alternative ductless HVAC system <input type="checkbox"/> Total duct leakage is $\leq 4$ CFM per 100 sq. ft. of conditioned floor area. <sup>6</sup>
4. Water Efficiency	<input type="checkbox"/> Plumbing fixtures, toilets, and hot water distribution shall meet EPA Water Sense requirements
5. Lighting & Appliances <sup>7</sup>	<input type="checkbox"/> All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified. <input type="checkbox"/> ENERGY STAR qualified fixtures or bulbs in minimum 80% of sockets <input type="checkbox"/> All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified
6. Indoor Air Quality	<input type="checkbox"/> EPA Indoor airPLUS Verification Checklist
7. Renewable Ready <sup>8</sup>	<input type="checkbox"/> EPA Renewable Energy Ready Home Solar Electric Checklist <input type="checkbox"/> EPA Renewable Energy Ready Home Solar Thermal Checklist

## Exhibit 2: Builders Challenge Target Home <sup>2,4</sup>

HVAC Equipment			
	Hot Climates (2009 IECC Zones 1,2) <sup>9</sup>	Mixed Climates (2009 IECC Zones 3,4,5) <sup>9</sup>	Cold Climates (2009 IECC Zones 6,7,8) <sup>9</sup>
AFUE	$\geq 80\%$	$\geq 90\%$	$\geq 94\%$
SEER	$\geq 18$	$\geq 15$	$\geq 13$
HSPF	$\geq 8.2$	$\geq 9$	$\geq 10$ <sup>10</sup>
Geothermal Heat Pump	1.25 x ENERGY STAR EER and COP Criteria		
ASHRAE 62.2 Ventilation	Any	any	HRV or ERV <sup>11</sup>
Insulation and Infiltration			
<ul style="list-style-type: none"> <li>Insulation levels shall meet the 2012 IECC and achieve Grade 1 installation, per RESNET standards. <sup>12</sup></li> <li>Minimum R-4 insulation on heating and cooling system ducts</li> <li>Infiltration<sup>13</sup> (ACH50): 3 in CZ's 1-2   2.5 in CZ's 3-4   2 in CZ's 5-7   1.5 in CZ 8</li> </ul>			
Windows <sup>14,15,16</sup>			
	Hot Climates (2009 IECC Zones 1,2) <sup>9</sup>	Mixed Climates (2009 IECC Zones 3,4,5) <sup>9</sup>	Cold Climates (2009 IECC Zones 6,7,8) <sup>9</sup>
SHGC	$\leq .25$	$\leq .27$	any
U-Value	$\leq .4$	$\leq .3$	$\leq .27$
Where Window to floor area (WFA) > 15%, SHGC's and U-values specified above shall be modified by: <b>[0.15/WFA] x value</b>			
Water Heater			
ENERGY STAR minimum			
Thermostat <sup>17</sup> & Ductwork			
<ul style="list-style-type: none"> <li>Programmable thermostat (except for zones with radiant heat)</li> </ul>			
Lighting & Appliances			
<ul style="list-style-type: none"> <li>For purposes of calculating the Builders Challenge HERS Target, homes must be modeled with an ENERGY STAR dishwasher, ENERGY STAR refrigerator, ENERGY STAR ceiling fans, and ENERGY STAR bulbs in 80% of sockets.</li> </ul>			



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## Exhibit 3: Benchmark Home Size<sup>18</sup>

Bedrooms in Home to be Built	1	2	3	4	5	6	7	8
Conditioned Floor Area Benchmark Home	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

### Footnotes:

<sup>1</sup> In the event that a Rater is not able to determine whether an item is consistent with the intent of a provision, (e.g., an alternative method of meeting a checklist requirement has been proposed), then the Rater shall consult their Provider. If the Provider also cannot make this determination, then the Rater or Provider shall report the issue to DOE prior to project completion at: [builderschallenge@newportpartnersllc.com](mailto:builderschallenge@newportpartnersllc.com) and will typically receive an initial response within 5 business days. If DOE believes the current program guidelines are sufficiently clear to determine whether the intent has been met, then this guidance will be provided to the Partner and enforced beginning with the house in question. However, if DOE believes the program guidelines require revisions to make the intent clear, then this guidance will be provided to the Partner but only enforced for homes permitted after a specified transition period after the release of the revised guidelines, typically 60 days in length. This process will allow DOE to make formal policy decisions as Partner questions arise and to disseminate these policy decisions through the periodic release of revised program documents to ensure consistent application of the program guidelines.

<sup>2</sup> State energy code specifications that exceed the Builders Challenge National Program Requirements always take precedence and shall be used in their place to determine Builders Challenge compliance. In states with both performance and prescriptive compliance paths for their energy codes, the prescriptive path specifications shall be used for comparing rigor to the Builders Challenge National Program Requirements and as input values for calculating HERS Index Score for the Builders Challenge Target Home where more rigorous than specified in Exhibit 2. In states with only a performance compliance path, DOE will provide corresponding input values to be used calculating the HERS Index Score for the Builders Challenge Target Home.

<sup>3</sup> On-site power generation may not be used to qualify a home for the Builders Challenge Target Home requirements, but can be used to achieve additional HERS Index Score reductions needed for homes larger than the Benchmark Home.

<sup>4</sup> Due to the unique nature of the Hawaiian climate, DOE offers a regionally-developed definition of Builders Challenge for that state.

<sup>5</sup> Building envelope assemblies, including exterior walls and unvented attic assemblies (where used), shall comply with the relevant vapor retarder provisions of the 2009 International Residential Code.

<sup>6</sup> Duct leakage must be determined and documented by a DOE-approved verifier using a RESNET-approved or equivalent ASTM-approved testing protocol.

<sup>7</sup> Further efficiency and savings can be achieved by installing ENERGY STAR qualified products in addition to those required.

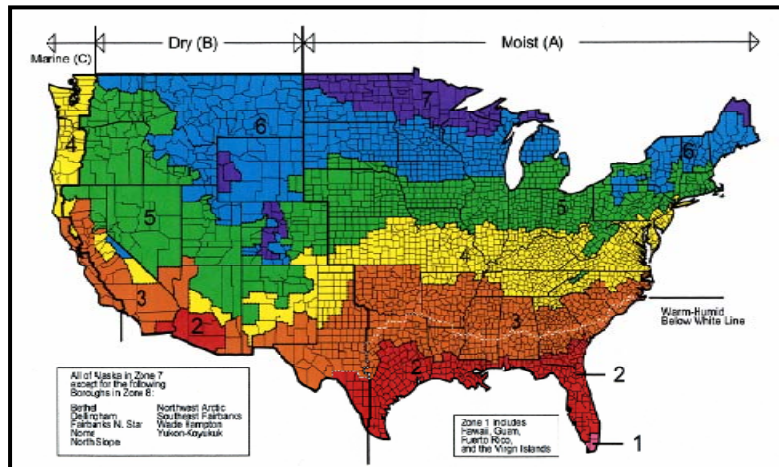
<sup>8</sup> The Renewable Energy Ready Home checklists only apply where a solar electric and/or solar thermal system is not already included with the home. Homes are also exempt from this requirement in locations with less than 5 kWh/m<sup>2</sup>/day average daily solar radiation based on annual solar insolation (<http://www.energysavers.gov/pdfs/208.pdf>).

<sup>9</sup> The following Map is shown to depict climate zone boundaries. It is for illustrative purposes only and is based on the 2009 IECC.

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**2009 IECC Climate Zone Map**



- <sup>10</sup> DOE recommends, but does not require, that air source heat pumps not be used in Climate Zones 6, 7, and 8.
- <sup>11</sup> Exhaust-only ventilation tied to heat pump water heaters will be considered an acceptable alternative high-efficiency whole-house ventilation system for cold climates.
- <sup>12</sup> Compliance can be determined by meeting Builders Challenge requirements based on prescriptive insulation requirements, or U-factor alternatives. Note that the U-factor for steel-frame envelope assemblies must be calculated using the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method. Additionally, reduction of ceiling insulation in space constrained roof/ceiling assemblies must be limited to 500 sq. ft. or 20% of ceiling area, whichever is less. In all cases, insulation must be inspected to Grade I installation as defined in the RESNET Standards by an approved verifier.
- <sup>13</sup> Envelope leakage must be determined by an approved verifier using a RESNET-approved testing protocol.
- <sup>14</sup> All decorative glass and skylight window areas count toward the total window area to above-grade conditioned floor area (WFA) ratio.
- <sup>15</sup> Up to 0.75% WFA may be used for decorative glass that does not meet CLIMATE CHOICE requirements. For example, a home with total above-grade conditioned floor area of 2,000 sq. ft. may have up to 15 sq. ft. (0.75% of 2,000) of decorative glass.
- <sup>16</sup> DOE strongly encourages all Builders Challenge partners to consider using R-5 windows in cold climates in anticipation of them becoming the state-of-the-art window choice in the near future. Visit the DOE web site (<http://www1.eere.energy.gov/buildings/windowsvolumepurchase/>) for more details and sources of these windows.
- <sup>17</sup> In homes with heat pumps, programmable thermostats shall have "Adaptive Recovery" technology to prevent the excessive use of electric back-up heating.
- <sup>18</sup> The average-size home for a specific number of bedrooms is termed "Benchmark Home". The conditioned floor area for a Benchmark Home (CFA Benchmark Home) is determined by selecting the appropriate value from Exhibit 3. For homes with more than 8 bedrooms, the CFA Benchmark Home shall be determined by incrementally adding an additional 660 sq. ft. per bedroom.

10 Bedroom Home Example: Benchmark Home = (2 x 660) + 5,280 = 6,600 sq. ft.